these few researches. I say apparently, because it is certain that there have been other researches which probably, on account of failure to attain some immediate object, have not been recorded, although they may have yielded valuable experience which, though not put on record, has, before it was forgotten, led to other attempts. But even discounting such lost researches, it is very evident that mechanical science was in the past very much hampered by the want of sufficient inducement to the undertaking of experiments to settle questions of the utmost importance to general advance, but which have not promised pecuniary returns—scientific questions which involved a greater sacrifice of time and money than individuals could afford. In recent periods the aid and encouragement which it has been one of the first objects of the British Association to afford such rosearches has led to many results of the greatest importance, both directly and indirectly, by the effect of example in calling forth aid from other institutions—that of mechanical engineers, for instance, which recently induced Mr. Tower to carry out his already celebrated research on "The Friction of Lubricated Journals," the results of which research certainly claim notice as constituting one of the most important of recent steps in mechanical science. Such investigations it is now the function as well as the interest of mechanical laboratories to undertake, and thus what has hitherto been a great obstacle in the path of mechanical progress seems in a fair way to be removed and steady advance to be insured.

To what all this may lead us it is no part of my undertaking to consider, but I venture to end this imperfect address on the progress of mechanical science during the past twenty-six years by what appears to me the most satisfactory conclusion—viz. that to such mechanical progress there is apparently no end: for, as in the past so in the future, each step in any direction will remove limits and carry us past barriers which have till then blocked the way in other directions; and so what for the time may appear to be a visible end or practical limit will turn out but a bend in the road.

NOTES.

Dr. Johannes Skalweit, the well-known chemist, has died at Hanover, of heart disease. The deceased was in the prime of life, and enjoyed a high reputation all over the Continent. He was, according to the *Times*, President of the German Union of Analytical Chemists—whose annual conference has been postponed in consequence of his death—and editor of the *Repertorium für Analytische Chemie*. A large number of essays and other short works on questions of sanitary science, State medicine, and chemical analysis have issued from his pen. Among the most important may be mentioned "Ueber Fette im Polarisirten Licht" (Hanover, 1879); "Ueber die Titration der Phosphorsaüre mit Uran" (Hanover, 1880); "In wie weit ist der heutige Kampf gegen die Lebensmittelfälschung gerechtfertigt?" (Hanover, 1880); "Ueber die Beziehungen zwischen Bauordnung und Oeffentlicher Gesundheitspflege" (Magdeburg, 1885). Dr. Skalweit was an authority on milk and butter analysis.

Sir William Grove, F.R.S., has resigned his seat on the Bench as Judge of the High Court of Justice.

The Secretary of State for India has sanctioned the appointment of a scientific assistant in the Revenue and Agricultural Department of the Government of India, and Dr. Watt, C.I.E., has been selected for the office.

Mr. G. Brown Goode has been appointed United States Commissioner of Fish and Fisheries in succession to the late Prof. Spencer Baird. *Science* approves highly of the appointment, observing that it meets at once the requirements of an exacting office and the exceptional provisions of the law creating it. "Prof. Goode was intimately acquainted with the methods of Commissioner Baird, whose scientific zeal and knowledge he shared, and his experience and attainments in practical fish culture and in the science of ichthyology made him easily first among those whose qualifications the President has been called upon to consider." At the same time it regards the provisions of the law under which the appointment was made as sadly in need of amendment, for under them the Fish Commissioner is not paid a salary commensurate with the importance of his office, and discharges the duties of two offices for the pay of one.

According to a Reuter's telegram, dated September 9, from St. Paul de Loanda, Major Barttelot, who was left at the camp at Yambunga at the foot of the Aruwhimi Rapids with a garrison of about 100 men, has forwarded the following information to Leopoldville concerning Mr. H. M. Stanley's Expedition:—"Major Barttelot received news from Mr. Stanley, despatched about July 12, after he had made a ten days' march from Yambunga towards the interior. Mr. Stanley was at that date still proceeding up the Aruwhimi, which he had found to be navigable up to a certain distance above the rapids. Here he launched a steel whale-boat which he had brought with him, as well as several rafts manufactured by the Expedition, and which had been utilized for conveying the heavy baggage. All the members of the Expedition were in good health, and provisions were easily procured in the large villages near the river. The country through which the Expedition was passing showed a gradual rise towards some high table-lands. Another caravan of 480 men was following the Expedition on the left bank of the Aruwhimi, the advanced guard, consisting of forty Zanzibaris, under the command of Lieut. Stairs, being composed of men lightly burdened, whose duty was to search for provisions. Mr. Stanley hoped to arrive about July 22 in the centre of the Mabodi district, and expected to reach Wadelai in the middle of August, or even before. The advance had been so peaceably accomplished that Mr. Stanley had instructed Major Barttelot that, should it continue so, he would shortly send him orders to follow the Expedition by the same route at the head of the 100 men left at Yambunga." Major Barttelot had paid a visit to the Falls, accompanied by Tippoo Tib, and had left a detachment of twenty men there. Tippoo Tib arrived at the Falls Station on June 16.

In moving the second reading of the Coal Mines Regulation Bill in the House of Lords on the evening of the 7th instant, Viscount Cross said he took that opportunity of tendering the thanks of the Government to the Royal Society for the trouble they had taken in the matter of coal-mines. In the year 1879 he had asked the Society to join, or send some of their members to assist, the Royal Commission which was then appointed for the purpose of seeing how accidents in mines could best be prevented. The Royal Society, he said, met the appeal in the most handsome way, and several of their most distinguished members served on the Commission. The labours of the Commission lasted for a period of six years; they went minutely into a long series of experiments, and while he was quite sure the results of those experiments would tend greatly to the safety of life and the prevention of accidents, it was satisfactory to know that they had also added very much to their own scientific knowledge, because he believed the members of the Commission all candidly admitted that in the course of their investigations they made several discoveries about gases and other matters that were absolutely unknown to them before. The result had been that a great many of their recommendations had been embodied in this Bill.

The International Medical Congress at Washington held its final sitting on the 10th inst. The meeting for 1890 will be held at Berlin, with Prof. Virchow as President.

The Technical Schools (Scotland) Bill was read a third time in the House of Commons on Friday night last, and a second time in the House of Lords on Tuesday night.

The Japanese Minister of Education has invited the Seismological Society, the Institute of Architects, the Association of Engineers, and the Physical and Mathematical Society to appoint a joint committee to examine and report upon the type of buildings best calculated to resist the effects of earthquake shocks, as well as the methods by which these effects may best be mitigated. Formerly Japanese houses were built wholly of wood; but of late years brick and stone are being largely employed. Many public edifices are now constructed of masonry, and almost all public buildings will in future be of this character. The Minister of Education accordingly thinks it well that the subject of the protection of these from the results of earthquake shocks should be carefully studied by competent persons.

THE meeting of the Astronomische Gesellshaft at Kiel, under the presidency of M. Auwers, terminated on the 31st ult. The meeting for 1889 will be held at Brussels. Amongst the papers read was one by M. Peters, of Kiel, on the causes of error in marine chronometers, based on observations in the German marine. One source of error was found to be variations similar to those caused by differences of temperature, and produced by the great humidity of the air at sea. Prof. Gylden described a new and simple method of maintaining chronometers at a constant temperature. There were some discussions on the orbits of comets. Prof. Shœrer read an historical paper on sunspots, based on a manuscript of Stolberg, commenced in 1749 and concluded in 1799. From this it appears that the periods observed in 1700 were quite different from those noticed in our own day. Between 1645 and 1670 the spots were very much fewer. Other circumstances also show that these phenomena are subject to curious vicissitudes. At the final meeting on August 31 the Congress was mainly occupied with photography. M. Hartwig presented a plan of the Bamberg Observatory, and M. Hertz described the new Observatory at Vienna.

WE have received the programme of Technological Examinations for the coming year of the City and Guilds of London Institute. Amongst the alterations and additions for the year are the following: the grant made to teachers on account of students who are awarded the full technological certificate in the honours grade of any subject is £3 for a first class, and £2 for a second class certificate; the examination in subject 29 is divided into two parts; the syllabus of 16B has been reconstructed; the syllabus in subject 2 and also that in 3A are new, and in many other cases the syllabuses have been revised and altered.

WE have received the Calendar of the University College, Dundee, for the coming academical year. The volume also contains the report of the Principal for the session 1886-87. The latter exhibits very satisfactory progress in every direction.

MR. ALVAN CLARK, of Cambridgeport, Mass., U.S.A., who died the other day at the age of eighty-three, had made for himself a splendid reputation as an optician. Mr. Clark was what is called a self-made man, as his education was neglected, and at the age of seventeen he was thrown on his own resources. For some time he supported himself by engraving for calico-printing at Lowell. Afterwards he became a painter of miniature portraits on ivory. In 1835 he opened a studio at Boston, but in the following year he removed with his wife and family to Cambridgeport, where he ever afterwards resided. His attention was attracted to the making of telescopes almost by accident, and he began his labours in this department with telescopes of small sizes. His first success was a 4½-inch instrument, with which he discovered that the star 8 Sextantis is double. Other discoveries soon made his lenses well known; and he may be said to have established his reputation by the production of the 18-inch refractor ordered for the University of the Mississippi. The use of this glass, before the completion of the telescope, led to the discovery of the companion of Sirius—a discovery which was rewarded with the Lalande medal of the Paris Academy of Sciences. Since that time some of the largest telescopes in existence have been made by Mr. Clark and his sons. The telescope constructed by them for the Naval Observatory at Washington is of 26 inches aperture, and the magnificent instrument now being made for the Lick Observatory, Mount Hamilton, California, is of 36 inches aperture. Clark telescopes are known in every part of the world where astronomy is seriously studied.

THE inaugural address at St. Thomas's Hospital Medical School, at the commencement of the session 1887-88, will be delivered in the theatre of the hospital on October 1 at 3 p.m. by Mr. R. W. Reid, F.R.C.S.

A NOTE was presented by M. Ch. V. Zenger, at the meeting of the Paris Academy of Sciences on September 5, on a possible relation between the periodical showers of shooting-stars and the occurrence of fires of unknown origin. From a study of the statistics for several years, he infers that such coincidences are extremely frequent, the fires usually breaking out in woods, farmsteads, barns, mills, and also in villages and even in large towns. He points out that during the period from August 1 to August 18, 1887, violent storms, rich meteoric displays, and conflagrations were of frequent occurrence.

PROF. DITTMAR, of the Glasgow and West of Scotland Technical College, is about to publish a series of exercises in quantitative chemical analysis, with a treatise on gas analysis. The publishers are Hodge and Co., Glasgow.

A NEW gaseous oxide of manganese, of the composition MnO_4, has been discovered by Dr. Franke (*Journ. für praktische Chemie*, 1887, No. 14, p. 166). This new gas, which possesses a dark blue colour, is readily obtained by passing a current of carbonic acid gas, saturated at 40° to 50° C. with aqueous vapour over the new oxysulphate of manganese, $(MnO_3)_2SO_4$, recently described by Dr. Franke; the issuing mixture of gases is afterwards passed through two U-tubes, in the first of which the less volatile MnO_3 condenses out, while the MnO_4 may be condensed at a lower temperature in the second to a bluish-violet amorphous body, which after long shaking dissolves in water with evolution of oxygen and formation of a bright red solution which is found to contain manganic acid. The properties of the tetroxide MnO_4 are sharply distinguished both from those of the trioxide MnO_3 and those of the heptoxide Mn_2O_7, in fact it is possible, owing to its small affinity for water, to collect the gas at the pneumatic trough. The decomposition of the oxysulphate by aqueous vapour probably occurs as follows: $(MnO_3)_2SO_4 + H_2O = MnO_4 + MnO_2 + H_2SO_4$.

IN addition to this most interesting gaseous oxide, Dr. Franke has also prepared a crystalline oxide of the composition Mn_5O_8, by treating a new double sulphate of manganese and potassium, $2Mn_5(SO_4)_8 . 5K_2SO_4$, with a large quantity of water, when brilliant yellow tabular crystals of Mn_5O_8 fall out, and may be isolated by removal of the supernatant acid liquid by decantation. After washing successively with water, alcohol, and ether, and drying at 80° to 100°, the oxide has the appearance of a brownish-black mass, which on closer examination is found to consist of small yellowish metallic-looking plates. Dilute sulphuric acid decomposes it with formation of two molecules of $MnSO_4$, and one molecule of the hydrate of manganese dioxide, $3MnO_2 . 2H2O$; hence this new oxide may be considered to have the constitution $3MnO_2 . 2MnO$.

THE fauna of the Kirghiz Steppe is the subject of a short but suggestive paper by M. Nazaroff, in the Bulletin of the Moscow Naturalists (vol. lxii., No. 4). The zoological sketch is preceded by a very clear summary of the orography and geology of the region, and by a picture of its present vegetation; a map shows the limits of the forest tracts, the meadow-land with scattered, mostly deciduous, forests, the steppe-land covered with *Stipa*, the *Artemisia* steppe, and the deserts. The animal inhabitants of these different sub-regions—mammals and birds—are described and tabulated, and very interesting conclusions are arrived at. It appears that when most of Russia was covered with the immense Scandinavian and Finnish ice-cap, and the Aral-Caspian Sea covered the steppes, the Southern Urals—as already pointed out by M. Menzbier in his "Géographie Ornithologique"—remained a refuge for many animal species. Owing to the greater moisture, the vegetation of the region was much richer than now, and thus it provided plenty of food for many animals, some of which were immigrants from the north, while others came from the south. It is for this reason that the fauna of the Southern Urals offers now such a great variety of forms. Many species have abandoned the region recently. In the last century the *Equus onager* and the wild horse were numerous in the Southern Urals, while the castor was common in the land of the Bashkirs, bears and *Cervus alces* were frequent in the steppe, and tigers reached Turgai. The corsac fox went as far as the 51st degree of latitude, and the sub-polar *Arctomys bobac* was widely spread in the forest region, while the reindeer, now found only beyond the 53rd degree, reached the southern parts of the Urals. Immense herds of antelopes abandoned the region only about thirty years ago. Notwithstanding this notable diminution of species inhabiting the Kirghiz Steppe, its fauna is still remarkably varied. As a whole the paper of M. Nazaroff, revised by M. Menzbier, will be most welcome to zoo-geographers. It is one of those partial, but not narrowly conceived descriptions of a limited region which are most needed now, when materials are so rapidly accumulating.

THE additions to the Zoological Society's Gardens during the past week include a Larger Hill Mynah (*Gracula religiosa*) from India, presented by Mr. P. Wilmot Bennitt, F.Z.S.; a Peaceful Dove (*Geopelia tranquilla*) from Australia, presented by Mr. R. O. Law Ogilby; a Green Bittern (*Butorides virescens*) from the West Indies, presented by Miss Mayrick; a Mexican Crocodile (*Crocodilus rhombifer*) from the West Indies, presented by Capt. J. Smith, s.s. *Godiva;* seven Angulated Tortoises (*Chersina angulata*), two Hoary Snakes (*Coronella cana*) from South Africa, presented by the Rev. G. H. R. Fisk, C.M.Z.S.; ten Short-nosed Sea-horses (*Hippocampus antiquorum*) from European coasts, presented by Prof. W. H. Flower, C.B., F.R.S.; a —— Flying Squirrel (*Pteromys* ——) from Szechuen, China, presented by Mr. Percy Montgomery; a —— Frog (*Discoglossus pictus*) from Sardinia, presented by Mr. Alban Doran, F.R.C.S.; an Oyster-catcher (*Hæmatopus ostralegus*) British, nine Smaller Rattlesnakes (*Crotalus miliarius*), four Testaceous Snakes (*Ptyas testacea*), two Alleghany Snakes (*Coluber alleghaniensis*), seven Milk Snakes (*Coluber eximius*), a Seven-banded Snake (*Tropidonotus leberis*), a Striped Snake (*Tropidonotus sirtalis*) from North America, deposited; two Common Squirrels (*Sciurus vulgaris*) British, a White-eyebrowed Guan (*Penelope superciliaris*) from North-East Brazil, two Smaller Rattlesnakes (*Crotalus miliarius*), a Testaceous Snake (*Ptyas testacea*), two Milk Snakes (*Coluber eximius*), a Copper-bellied Snake (*Tropidonotus erythrogaster*) from North America, purchased.

OUR ASTRONOMICAL COLUMN.

THE NEUCHÂTEL OBSERVATORY.—Dr. Hirsch, the Director of the Neuchâtel Observatory, has published his Annual Report for the year 1886, dated June 21, 1887. On the whole, Dr. Hirsch reports that, as far as his Observatory is concerned, the year 1886 was somewhat more favourable for astronomical observations than was 1885. In 1886 there were 154 nights on which observations were made, and 124 days on which no observations were possible, the longest interval without observations having been 7 days; whilst in 1885 the number of observing nights was 150, the number of days without observations 135, and the longest interval without observations 20 days. The meridian observations made during the year comprise 192 observations of the sun, 16 of planets, 1401 of fundamental stars, and 909 of stars contained in M. Lœwy's Catalogue of Moon-Culminating and Longitude Stars. The equatorial telescope has been employed in the observation of planets and comets with the ring micrometer, the position micrometer not being available until the small incandescent lamps, which are to be provided for purposes of illumination, have been supplied. Dr. Hirsch gives some interesting particulars with regard to the azimuthal movements of the meridian circle, as well as of the distant marks used for determination of azimuth error. The maximum easterly azimuth (+ 3·03s.) of the meridian circle during the year was observed on March 11, whilst the maximum westerly azimuth (– 1·02s.) was observed on September 1; the total range throughout the year 1886 was therefore 4·05s., the corresponding mean value for 22 years being 5·20s. It appears, however, that the three meridian marks (two to the north and one to the south) do not participate in this movement. The azimuth of one of the north marks, situated at a distance of 100 m. from the Observatory, varied during 1886 between + 0·24s. on May 19 and – 0·25s. on August 29, thus showing a total range of only 0·49s. The other more distant north mark showed a range of 0·42s., the extremes being + 0·18s. on April 16 and – 0·24s. on August 7; whilst the south mark at about 10 km. distance varied from + 0·40s. on May 14 to – 0·01s. on July 3, the range being therefore 0·41s. The marks are consequently well adapted for determining the azimuth of the meridian circle, the mean of the three giving this element, according to Dr. Hirsch's estimation, to ± 0·012s. nearly.

THE WEDGE PHOTOMETER.—Prof. Pickering has recently published two papers relating to the wedge photometer employed by Prof. Pritchard in the formation of his Oxford Uranometria. The first of these, forming No. 2 of the papers comprising vol. xviii. of the Annals of the Harvard College Observatory, consists in a detailed comparison of the Oxford magnitudes with those of Wolff's second Catalogue, and of the Harvard Photometry. The latter comparison appears to show the existence of some real, though small, systematic error, since the mean difference of magnitude between the two catalogues changes with the brightness of the star; the Oxford magnitude being on the average less than the Harvard magnitude for stars down to the third magnitude, but greater for the fourth and fifth, and less again for stars below the sixth magnitude. If stars below the sixth magnitude be put aside as influenced by some special cause not yet ascertained, the results would seem to suggest the use of a different constant in the reduction of the observations made by means of the wedge from that actually employed. The comparison of the three catalogues gives the following result: mean deviation of Wolff's catalogue from that of the Harvard College, 0·140; Oxford from Harvard, 0·146; Oxford from Wolff's, 0·191. On the whole, therefore, the mean outstanding differences are but small, but will evidently repay further and detailed investigation.

The second paper, which was presented to the American Academy of Arts and Sciences last November, is an investigation into the behaviour of a wedge photometer similar to those used by Prof. Pritchard. Its first portion contains some trial observations made by Prof. Young with a wedge photometer attached to the great Princeton refractor on the stars in the "region following γ Pegasi" of the American Association star magnitude charts. The result was decidedly favourable to the wedge, as, though all the stars observed were faint, the magnitudes ranging from 10 to 13, the probable error of the magnitude determined from four nights' observations was ± 0·04. The second portion of the paper contains a very full and interesting examination by Prof. Langley, by means of his bolometer, of the coefficients of transmission of the wedge. Here again the result of the examination is, on the whole, favourable to the wedge within the limits that Prof. Pritchard employed it; but it appears that there is a remarkable variation in the coefficient of transmission for the different rays of the spectrum. Speaking broadly, the transmissibility always increases from the violet towards the red, increasing very greatly in the infra-red. Within the visible portion of the spectrum the change in the transmissibility only becomes great as the red is approached, and as Prof. Pritchard had always recognized the inapplicability of the wedge photometer to deeply-coloured stars, this selective